NTEA COMMERCIAL VEHICLE
UPFITTING SUMMIT

Optimizing PTO Selection for Modern Vocational Trucks

Brad Gulick, Commercial Product Manager, Eaton Mobile Power Group

Introductions

EATON
Powering Business Worldwide

Brad Gulick
Commercial Product Manager, Mobile Power Group

EATON Cummins
AUTOMATED TRANSMISSION™ TECHNOLOGIES

Ken Rocker
Endurant Transmission Product Manger

Bz bezaresusa

Ed Felix
Field Engineer, Upfit Specialist

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Powertrain Considerations

Kenneth Rocker, Product Manager, Eaton Cummins Automated Transmission

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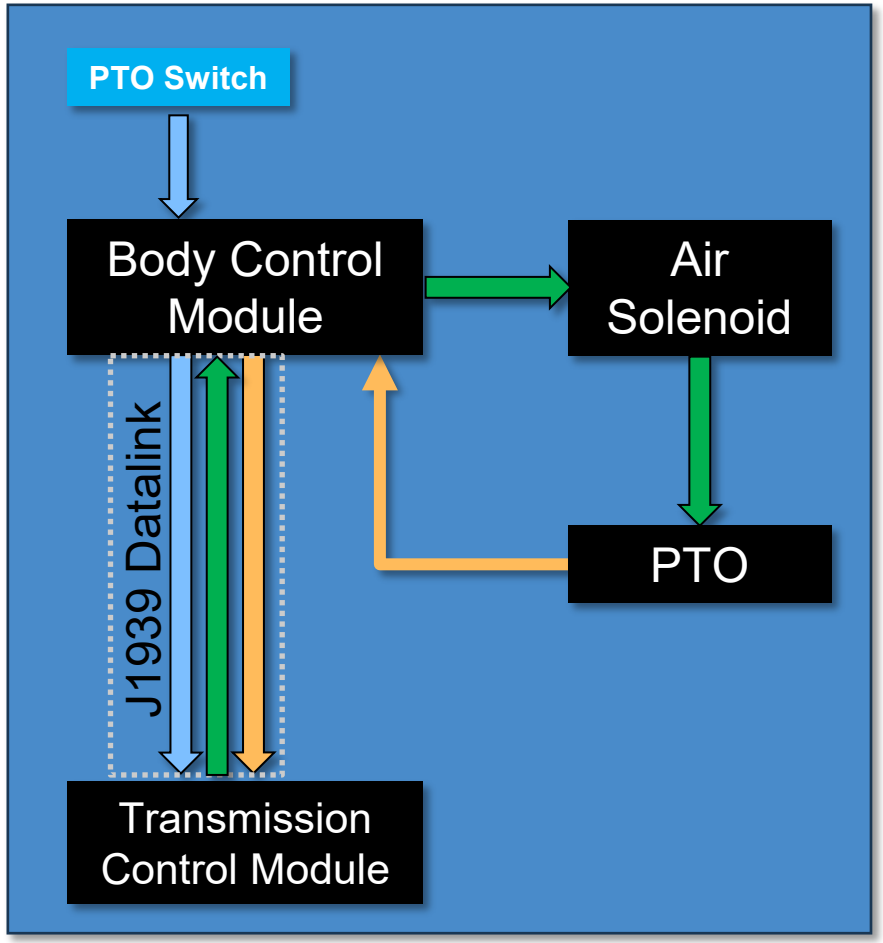
Know Your Electrical Integration

Multiplexed Factory Wiring

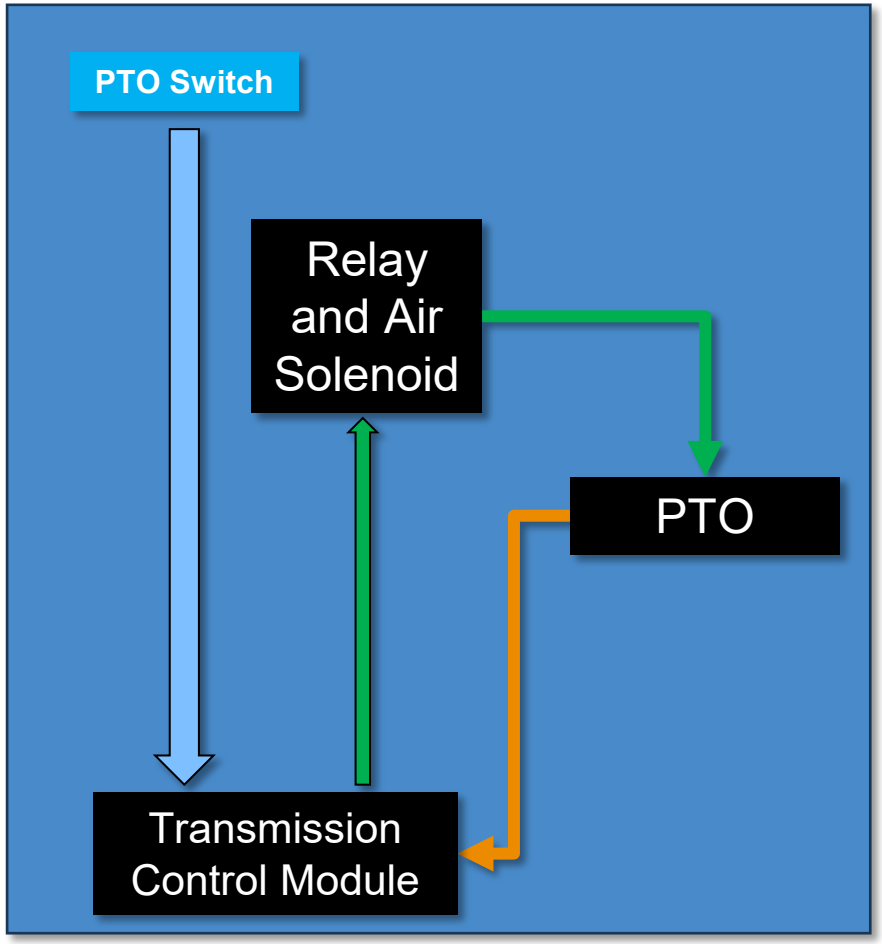
- Preferred option.
- Talk to dealer: Many option codes for switch and electrical prep.
- **Pro:** Cab ECU's will get needed J1939 signals to other components .
- **Pro:** Gains access to interlock features and logic configurations offered by the OEM.
- **Con:** Requires foresight at the time the truck is ordered.
- **Con:** Custom integrations can be a challenge.



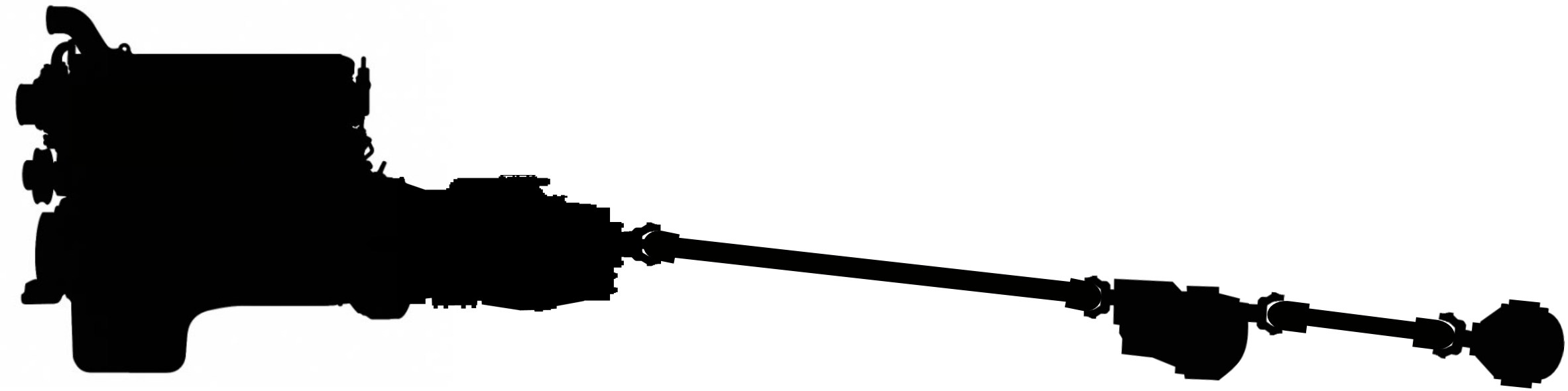
Know Your Electrical Integration

Direct to Transmission

- Use when chassis built without OEM option. (stock trucks or 2nd owner)
- Use when integration needs exceed what is offered by OEM.
- **Pro:** Custom integrations possible such as out-of-cab controls and complex interlocks.
- **Con:** It is a choose your own adventure: wiring, relays, controls responsibility of upfitter.
- **Con:** Not possible with all make/model transmissions.



Know Your Source of Power



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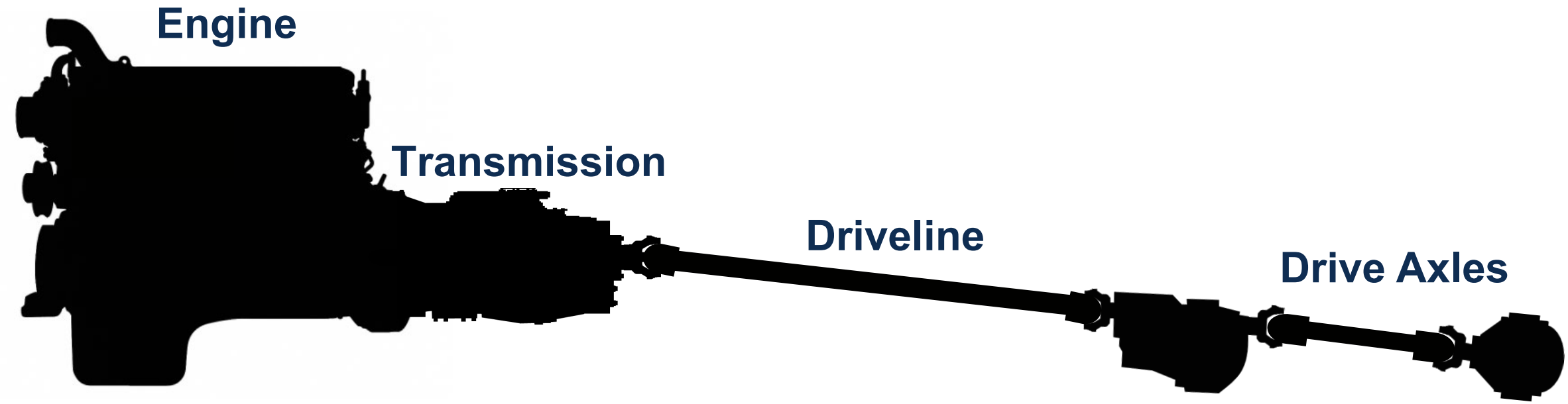

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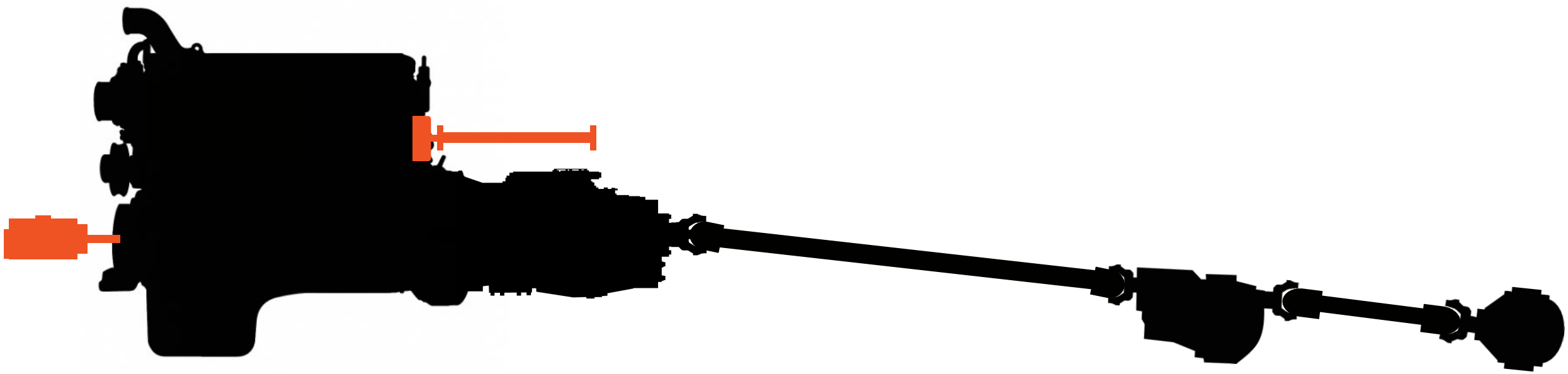

Live PTO/Engine PTO

- FEPTO or REPTO
- Mechanically coupled to engine.
- Uninterrupted power

Power:

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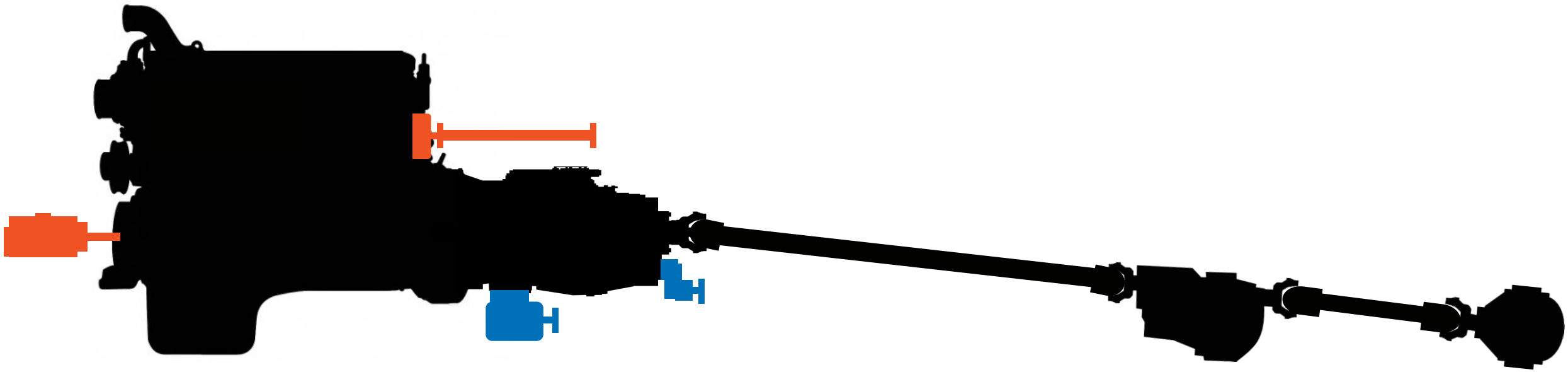

Live PTO/Engine PTO

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Power:

Transmission PTO

- Clutch and/or gear position dependent.
- Limited mobile use
- Easy access

Power:

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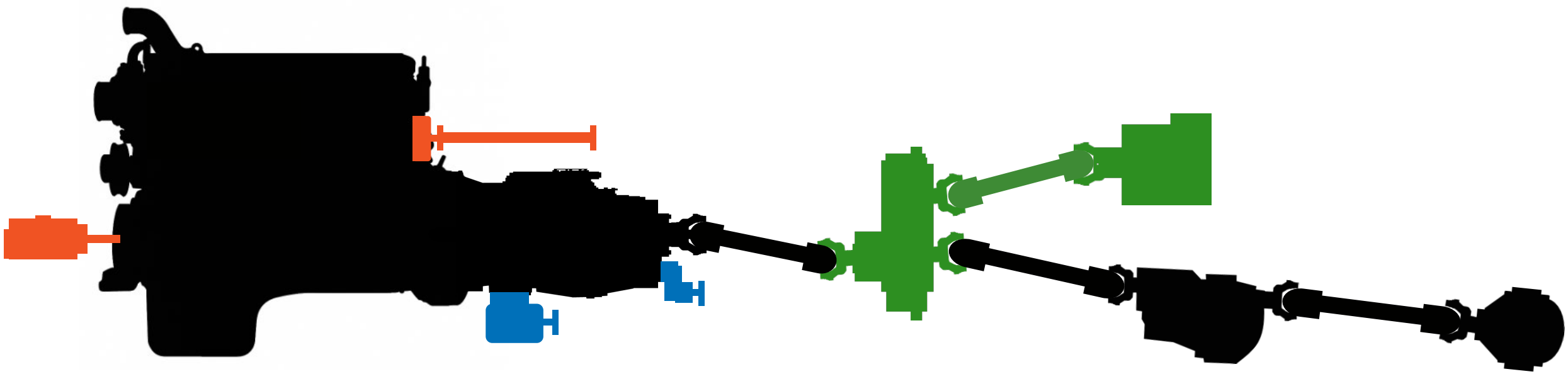

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Transmission PTO

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Power:

Split-Shaft PTO

- Invasive, high-power option.
- Inform dealer at time of order.

Power:

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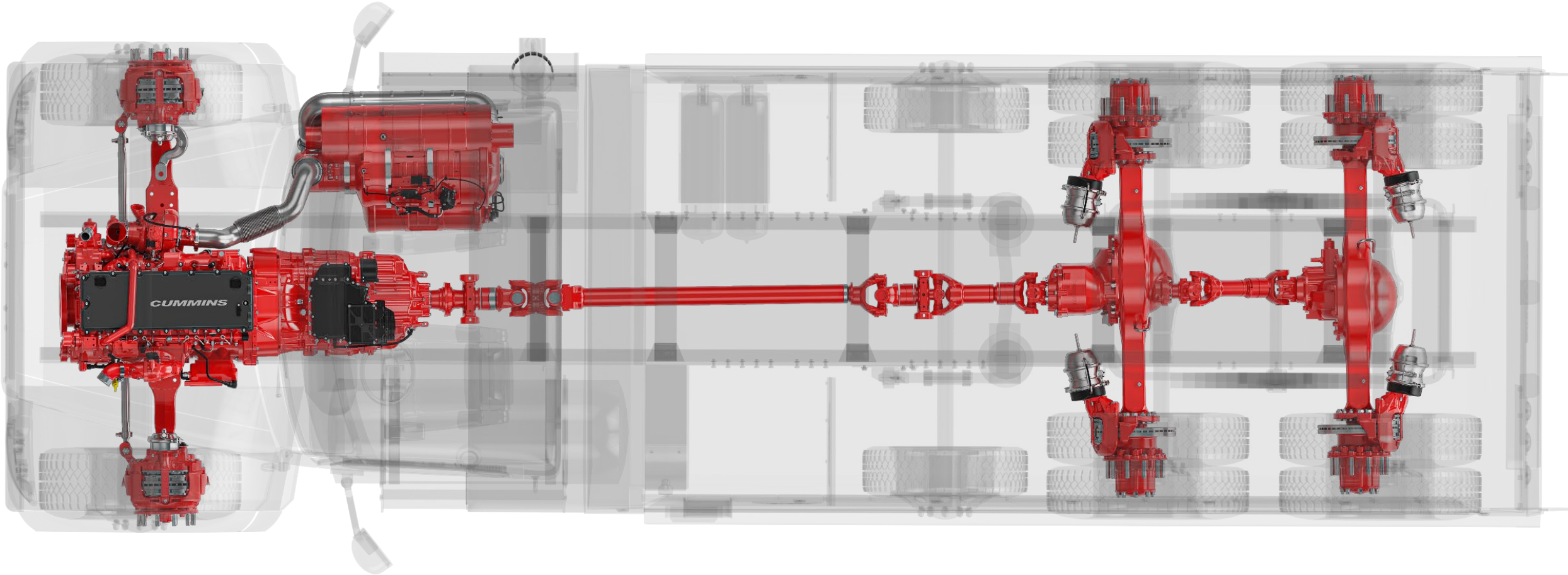
Know Your Space Claim



- PTO location and component mounting is ever changing.
- Understand when new chassis or powertrain will impact your components

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PTO Selection

Ed Felix – Field Engineer, Upfit Specialist, Bezares USA

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Know Your Application

- **What is the application?**
  Dump Trailer, Low Boy, Refuse Roll Off, etc. this will determine the series of pump to be used.

- **What is the desired flow requirement or Cubic Inch Displacement of the pump?**
  CID X RPM ÷ 231 = GPM - Most customers are likely to know the GPM of the pump rather than CID of the pump they need.

- **How will the pump be driven?**
  By a PTO, Crank of the Engine, Belt Driven – This will determine the Pump shaft and front cover needed on the pump.

- **What rotation do you need the pump to be?**
  CCW (Left Hand) or **CW** (Right Hand) **BI** (Bi-Rotational) Pump rotation will be determined by what's driving it.

- **What is the pressure requirements of the hydraulic system?**
  Always check your pumps performance specifications to make sure the pump can operate at the required system pressure.

Note: Always compare the pump input Horsepower Requirements to the PTO horsepower capability

HP= GPM x PSI ÷ 1714

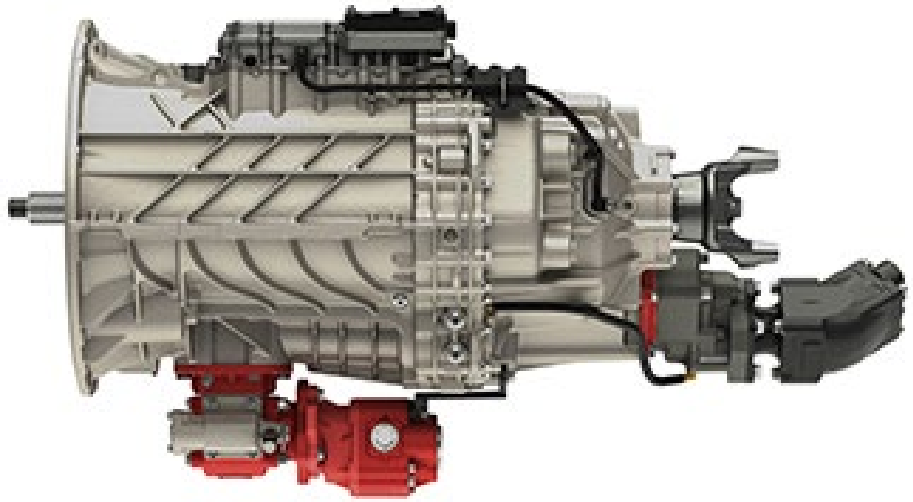
Power Take Off Selection (PTO)

- **PTO selection will be based off Transmission make and model and location on transmission PTO is to be mounted.**

  Manual, Automated or Automatic Transmission, mounting on the bottom, right or left side openings or rear of the transmission.

- **Speed, Horsepower and Torque Requirements are Key when picking the proper PTO**

  Speed or PTO % = Equipment Input Speed ÷ Engine Speed x 100



Example: Pump needs to turn 1000 rpm to get to 20 GPM @2500 psi, and the customer wants to run his truck at 800 RPM when using the system

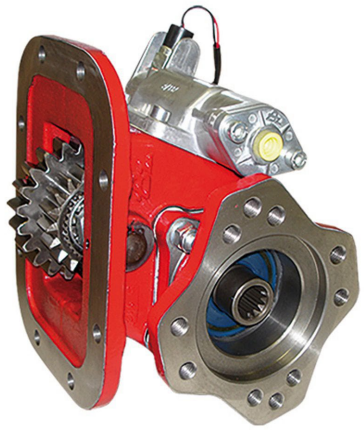
1000 Pump RPM ÷ 800 Engine RPM x 100 = 125% PTO to run his system

20 GPM X 2500 PSI ÷ 1714 = 29 HP

Torque = 29HP X 5252 ÷ 1000 Pump RPM = 152.3 lbs. ft. (Input RPM and not engine RPM)

Note: Refer to PTO Data sheet or Application Guide to verify if torque is within Spec.

Mechanical PTO's



🔧 *Overview*

- ***Top Brands**:* Eaton/Bezares, Muncie, Parker/Chelsea
- ***Engagement Types**:* Lever, Cable, Electric-over-Air, Air
- ***Torque Capacity**:* Up to **500+ lbs-ft**

⚙️ *Key Features*

- Multiple **output options** and **gear ratios**
- Compatible with **light-duty** and **heavy-duty** applications
- Durable and reliable for **vocational truck operations**

🚚 *Common Applications*

- Tow & Recovery
- End Dump & Dump Trucks
- Cranes
- Product Pumping Systems

📌 *Key Benefits*

- Simple mechanical design
- Cost-effective and robust
- Ideal for consistent, high-torque tasks

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Clutch Engaged PTO's (Hot Shift)

🔧 ***Transmission Compatibility:*** Automatic & Manual

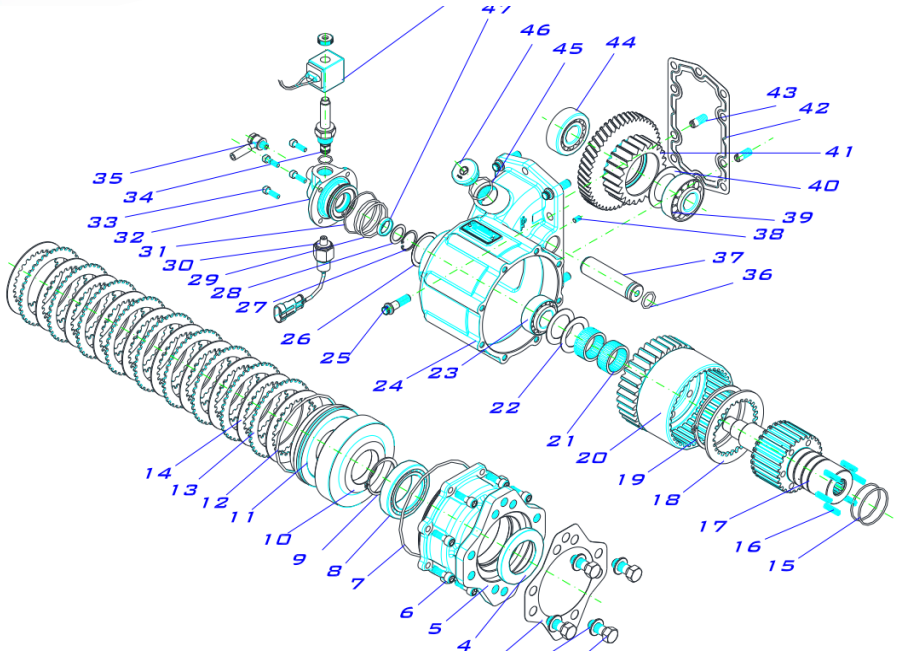
💨 ***Actuation Methods:*** Hydraulic or Pneumatic

📊 ***Torque Capacity:*** Up to 500+ lbs-ft

🔁 ***Output Options:*** Multiple outputs and gear ratios

🧠 ***Soft Start:*** Available for smoother engagement – Reduces shock load to the system upon engagement

🚚 ***Applications:*** Refuse, Snow & Ice, Tag Axle, Wet Kits, Blower/Vac, Dump Trucks, Tow & Recovery, Emergency Vehicles, Ground Support



✅ ***Key Benefits***

- Smooth engagement under load
- Ideal for high-torque, high-duty-cycle operations
- Versatile across multiple vocational applications

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Do you need a hot shift PTO?

Claim	Answer
"It's designed to be foolproof—drivers can't easily damage it."	No longer need a hot shift, software will prevent drivers grinding a PTO.
“We need to engage it from outside the cab.”	No longer need a hot shift, software and wiring can provide a no-cab solution.
“I need to turn the PTO on without stopping.”	Still needs a hot shift
“I need to turn the PTO off without stopping.”	Not needed, conventional PTOs will disengage with a torque interruption.
“I need to disconnect the PTO while it is under load.”	Still Needs a hot shift to avoid torque lock

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Constant Mesh PTO's

✅ ***Benefits of Constant Mesh PTOs***

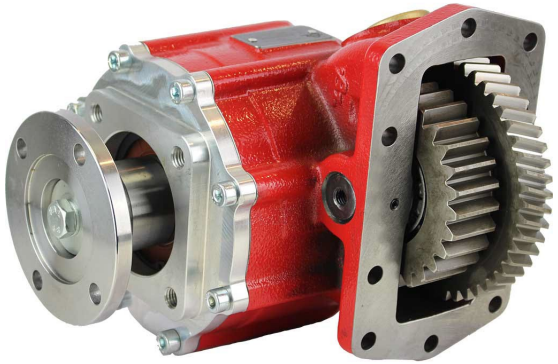
- ***Immediate Power Availability:*** Always live, no need to engage/disengage.

- ***Versatility:*** Suitable for a wide range of vocational applications.

- ***Durability:*** Designed for continuous-duty cycles.

- ***Simplified Operation:*** Reduces complexity in control systems.

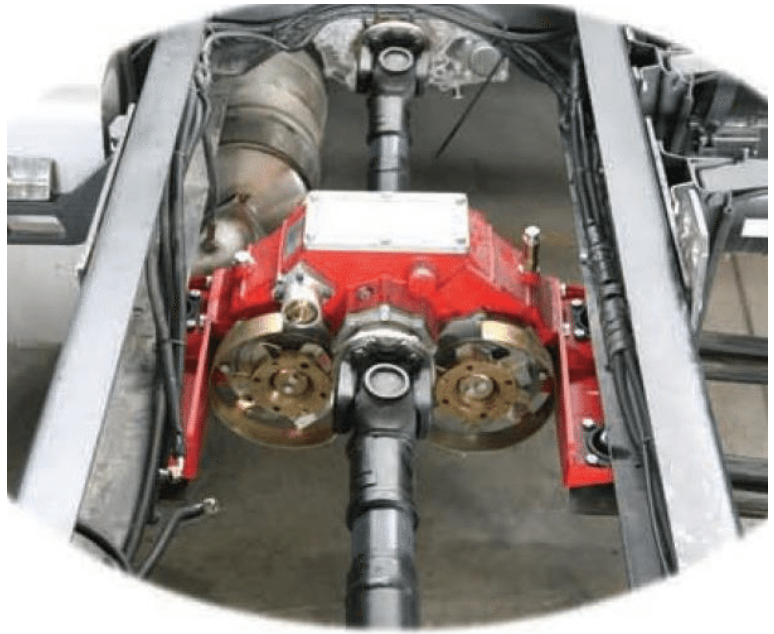
- ***High Torque Handling:*** Supports demanding equipment loads.



Typical Applications:

- Yard Trucks
- Refuse
- Snow & Ice
- Concrete Mixers
- Fire and Rescue
- Oil and Gas

Split Shaft PTO's



- ⚙️ ***Installation***: Mounted between transmission and rear axle
- 🔄 ***Engagement***: Requires vehicle to be stationary
- 📊 ***Torque Capacity***: High torque output for demanding applications
- 🔧 ***Drive Options***: Can drive front and rear auxiliary equipment
- 🚚 ***Applications***:

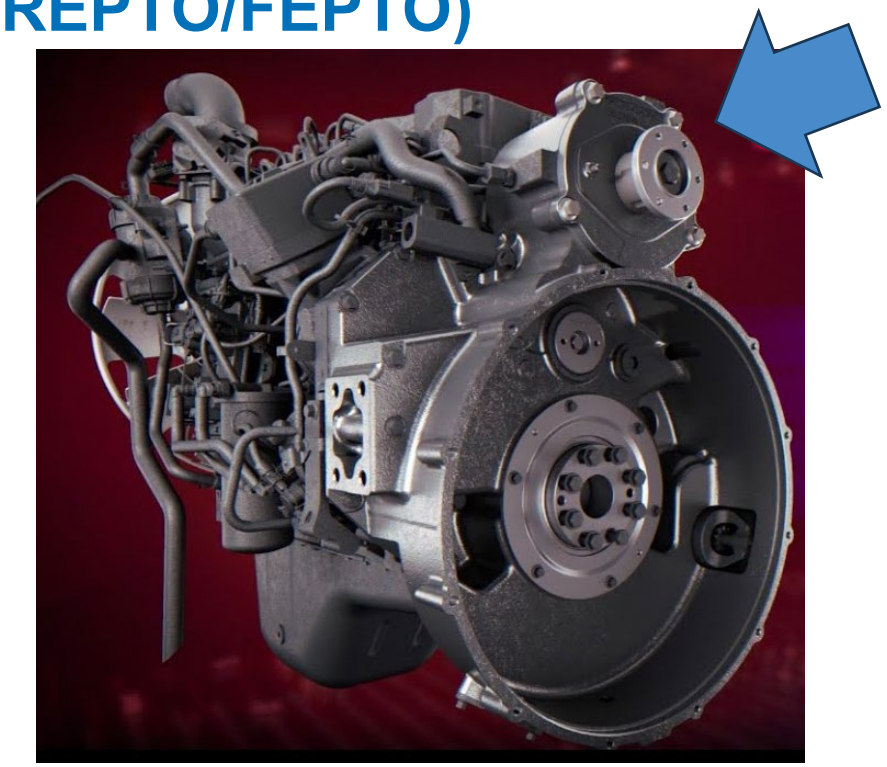
•Fire Trucks
•Vacuum Trucks
•Sewer Cleaners
•Mobile Drilling Rigs
•Specialty Vocational Vehicles

✅ ***Key Benefits***

•Enables high-power auxiliary systems
•Ideal for stationary operations
•Maximizes vehicle versatility

Engine PTO
REPTO / FEPTO

Engine Power Take Off (REPTO/FEPTO)



- 🔧 ***Engine Power Take-Off (REPTO/FEPTO)***
- ***Definition***:
  A **REPTO/FEPTO** is a power take-off system mounted at the **rear or front of the engine**, Taking power from the Crank of the engine .
- ***Key Characteristics***:
- **Direct drive** from the engine crankshaft.
- Often used when **continuous power** is needed while the vehicle is stationary or moving.
- Common in **fire trucks**, **refuse vehicles**, and **vacuum/blower trucks**.
- ***Advantages***:
- High torque capacity.
- Can operate independently of transmission engagement.
- Ideal for **stationary hydraulic operations**.

Driver Interface

Actuation Method	*Features*	*Benefits*
Pneumatic	Uses air pressure to engage/disengage PTO	Reliable in cold environments, good for high-torque applications
Electric	Solenoid or motor-driven engagement	Quick response, easy integration with vehicle electronics
Cable	Manual cable linkage from cab to PTO	Simple, low-cost, minimal maintenance
Lever	Direct mechanical linkage	Very reliable, no power source needed
Constant Mesh	Always engaged with transmission gear	Instant power availability, ideal for continuous-duty applications

Questions?

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